Monitoring of Tijuana River to Quantify and Respond to Transboundary Contamination

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The objective of this project is to install real-time water quality sensors in the Tijuana River Basin and estuary, to conduct continuous field measurements and develop the scientific studies necessary to quantify the magnitude of sediment and sewage contamination in the Tijuana River north of the US-Mexico border. The sensors include fluorescence sensors that quantify colored dissolved organic matter (CDOM) and tryptophan-like fluorescence (TRP), which can correlate with sewage contamination and bacteria concentrations. Our specific questions were:

1. How well do measurements from sensors (CDOM, TRP and turbidity) correlate with % wastewater and bacteria concentrations?
2. How do CDOM, TRP and % wastewater change during storm events and during sewage release periods?

Laboratory experiments: Wastewater was added to seawater, from 0% to 25% wastewater, in a laboratory experiment. TRP correlated very closely with %ww, and somewhat less closely with Enterrococcus concentrations (Figure 1):

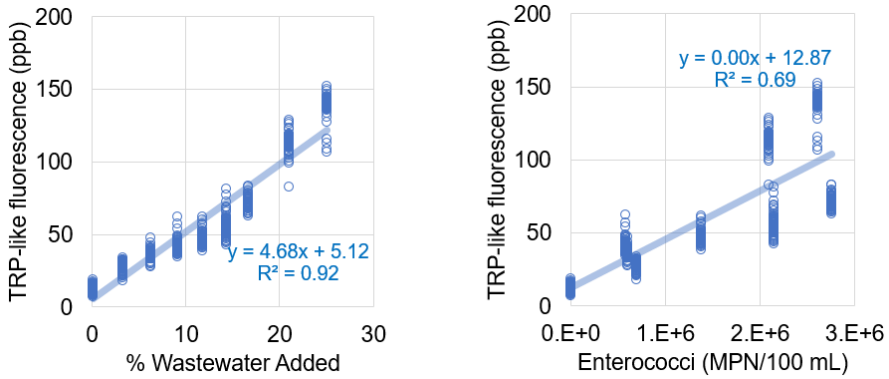

Figure 1. Correlations between tryptophan-like fluorescence (TRP) and percentage wastewater (left) and Enterococi (right), from laboratory wastewater addition experiments.

Field data collection: Sensors, including TRP, were installed in the Tijuana Estuary (starting 2021-03-01) and will be installed in the Tijuana River (starting 2022-10-01). The sensors show high TRP during and after storms events, including during the post-storm period, when raw sewage is still discharging in the Tijuana River:

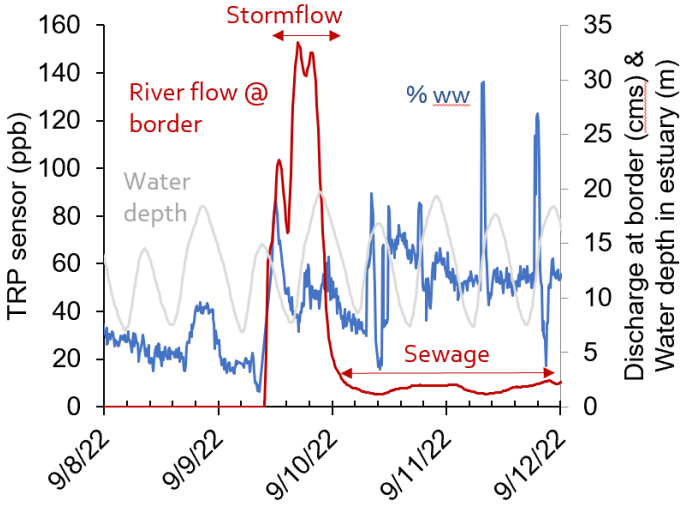

Figure 2. Time series of TRP fluorescence and % wastewater in the Tijuana Estuary (blue), water level in the estuary (grey) and discharge of water at the US-Mexico Border (red) during a storm event on 9/9/2022 to 9/10/2022. An immediate spike in % wastewater occurs at the beginning of the storm, and high %waste water persists during the sewage releases on Sept 11-12.

Next steps: A second sonde with a TRP sensor is being installed on the Tijuana River at the International Boundary and Water Commission gage. Monitoring and sample collection will occur during storm events to document the main source of bacteria and sewage pollution: the main storm event, or subsequent sewage release.